

Work Order ID 133623-3

133623

Page 1

June-12-15 7:50:13 AM

Item ID: D6020-160

Accept

N9000040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Crosstube Material

Start Date: 6/12/15 Start Qty: 23.00

23

Cust Item ID:

Required Date: 10/02/15 Req'd Qty: 23.00

23

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start *NR1*

QC:

Date:

SPC (Y/N):

Date:

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D6020	pa3 A ✓								
110	PURCHASING	0.00							
110									
Purchasing	Memo	0.00							
Purchasing	Issue P/O: 28800								
	Manufacture as per dwg D6020								
120	Receive & Inspect for Damage & Mat'l Certs	0.00							
120									
Packaging	Memo	0.00							
Packaging	Ensure material certification is attached								
130	QC6- Inspect dimensions to drawing	0.00							
130									
QC	Memo	0.00							
Quality Control	Ensure Material certification comply to Dwg								

CY 15/06/12 21

lex sp 16-01-20

(6)

DAS
38
9-88

JAN 25 2016

Work Order ID 133623

133623

Page 2

June-12-15 7:50:13 AM

Item ID: D6020-160 Accept *N900040100* Setup Start *NS1*
 Revision ID: Stop *NS2*
 Item Name: Crosstube Material
 Start Date: 6/12/15 Start Qty: 23.00 *23* Cust Item ID:
 Required Date: 10/02/15 Req'd Qty: 23.00 *23* Customer:
 Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start *NR1*
 QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
140 *140* Outsource1 Outsource process - Heat Treat	Outsource process - Heat Treat Memo Issue p/o: _____ Ensure Material certification	0.00 0.00	N/A						
150 *150* Packaging Packaging	Receive & Inspect for Damage & Mat'l Certs Memo Ensure Material certification	0.00 0.00							
160 *160* QC Quality Control	QC6- Inspect dimensions to drawing Memo	0.00 0.00							

Work Order ID 133623

133623

Page 3

June-12-15 7:50:13 AM

Item ID: D6020-160

Accept

N900040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Crosstube Material

Start Date: 6/12/15 Start Qty: 23.00

23

Cust Item ID:

Required Date: 10/02/15 Req'd Qty: 23.00

23

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start *NR1*

QC:

Date:

SPC (Y/N):

Date:

Stop *NR2*

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

190

Identify as per dwg & Stock Location: HALL

0.00

190

Packaging

Memo

0.00

Packaging

TJ 16-03-08

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

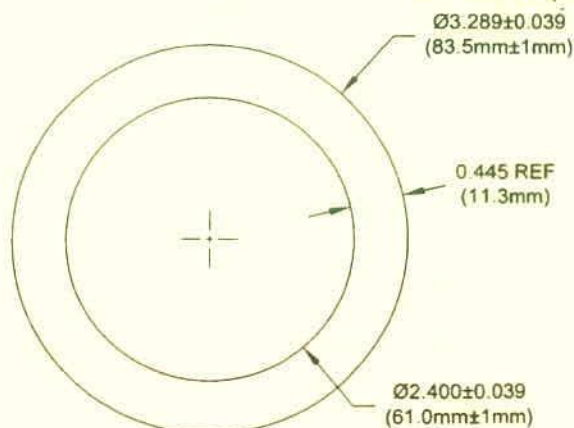
0.00

Quality Control

MCS MAR 23 2016

H16-3-17

SPECIFICATION CONTROL DRAWING



10133623

NOTES

1) D6020-XXX CROSSTUBE
LENGTH

WHERE XXX IS LENGTH IN INCHES
EG. 160" LONG TUBE D6020-160

2) MATERIAL: 17-4PH SEAMLESS STAINLESS STEEL TUBE PER ASTM A564
Ø3.289 O.D. x Ø2.400 I.D.

HEAT TREAT TO H1025 CONDITION (HRc 34-42);
MIN. ULTIMATE TENSILE STRENGTH = 155 ksi
MIN. YIELD TENSILE STRENGTH = 145 ksi

3) TOLERANCES ARE AS FOLLOWS:
ECCENTRICITY: 15% (+/-0.066" WALL)
LENGTH: XXX +0.188"/-0.000"
STRAIGHTNESS: 0.012" DEVIATION / 12" LENGTH

4) ALL DIMENSIONS ARE IN INCHES
5) TUBE MUST BE PICKLED OR ELECTROPOLISHED TO BE SMOOTH AND FREE FROM SCALE
6) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.

RELEASED
2013-08-14

REV	NEW ISSUE	DESCRIPTION	OP	13.04.24
DESIGN			BY	DATE
DRAWN				
CHECKED				
MFG. APPR.				
APPROVED				
DE APPR.				
DATE	13.04.24			

DART AEROSPACE LTD
HAWKESBURY, ONTARIO, CANADA

DRAWING NO
D6020
REV. A
SHEET 1 OF 1
SCALE
NTS
TITLE
CROSSTUBE MATERIAL

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Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7
Tel: 613 632 9577
Fax: 613 632 1053

PURCHASE ORDER

Purchase Order ID PO28800

Purchase Order Date 6/12/15

PO Print Date 6/17/15

Page Number 1 of 2

Order From :

VU-THI01

TUBE HOLLOWES INTERNATIONAL
39 ENTERPRISE DRIVE SUITE 2

WINDHAM, MAINE 04062
UNITED STATES

Ship To : DART AEROSPACE LTD
1270 ABERDEEN
HAWKESBURY, ON K6A 1K7
CANADA

Contact Name

Vendor Phone 207-892-8899

Ship To Contact

Ship To Phone

Ship Via: Journey Freight collect

Ship Acct:

Buyer

Chantal Lavoie

Customer POID

Customer Tax #

10127-2607

Terms

Net 30

Currency

USD

FOB

EXW - (Ex Works)

Line Nbr	Reference Vendor Part Number	Description/ Mfg ID	Req Date/ Taxable	CD	Req Qty/ Unit of Measure	PO Unit Price	Extended Price
	Line Comments		Promise Date				
	Delivery Comments						

D6020-160P

Crosstube Material

9/24/15

21.00

\$3,490.50

\$73,300.50

Yes

Each

9/24/15

MATERIAL: 17-4PH SEAMLESS STAINLESS STEEL TUBE
PER ASTM A564, HEAT TREAT TO H1025 CONDITION
(H1Rc 34-42), MIN. ULTIMATE TENSILE STRENGTH = 155
ksi, MIN. YIELD TENSILE STRENGTH = 145 ksi

TOLERANCES ARE AS FOLLOWS:
ECCENTRICITY: 15% (+/-0.066" WALL)

LENGTH: XXX +0.188"/-0.000"

STRAIGHTNESS: 0.012" DEVIATION / 12" LENGTH

B133623

Line Total:

\$73,300.50

PO Instructions: PROPOSAL NO: 15150

Note:

6/17/15

TUBE HOLLOWS INTERNATIONAL

39 ENTERPRISE DRIVE
SUITE 2
WINDHAM, ME 04062
PHONE: 207-892-8899 FAX: 207-892-8863

PACKING LIST

Packlist ID: 01594
Date: 1/15/2016
Page: 1

Sold To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

Ship To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

			CUSTOMER PO		PAYMENT TERMS		F.O.B.	
			28800		Net 30		WINDHAM	
SALES REP ID			SHIPPING METHOD		SHIP DATE		OUR ORDER NUMBER	
EVAN			JOURNEY FREIGHT		1/15/2016		DAR150141	
QUANTITY								
ORD	SHF	BCK	CUSTOMER PART ID	DESCRIPTION				

21.00 6.00 ✓ 0.00 CROSSTUBE

160" CROSSTUBE
Drawing: D6020-160P
Rev No:
Unit of Measure: EA

6 PIECES OF THI SUPPLIED 17-4 MATERIAL, MACHINED
PER DRAWING# D6024 REV. A.

S/N 11, 14, 16, 17, 18, 20

RE: THI WO# 150623/01

THANK YOU FOR THIS ORDER.

TOLERANCES ARE AS FOLLOWS:
ECCENTRICITY: 15% (+/-0.066" WALL).
LENGTH: XXX +0.188"/0.000".
STRAIGHTNESS: 0.012" DEVIATION / 12" LENGTH.

Rev No:

RECEIVED BY:

Sp 16-01-20

STATEMENT OF CONFORMANCE

Dart Aerospace Ltd.
1270 Aberdeen
Hawkesbury, ON K6A 1K7

Part #: D6020-160P
Material: 17-4 PH
Report Serial #: See Table below
Heat #: See Table below
Drawing #: D6020 Rev. A
P.O #: PO28800 L/I 1
THI WO#: 150623/01
Qty: 6

SP 16-01-20

Material Cert Report Serial Number:	Heat #:	Serial Number:
DNK-0066998-G22260-81249	G22260	11
DNK-0066998-G22575-81202	G22575-NJAGKF	14, 16, 17, 18
DNK-0066998-G22575-81386	G22575-NJAGHX	20

The above-mentioned parts have been inspected and conform to customer contract, purchase order, drawing, and other required specifications. All exceptions are noted below. Inspection data and all certifications are kept on file and available for review upon customer request.

Comments: This is the balance of line item 1 of this PO.
Length of SN 11 – 160.9", SN 14 – 161.1", SN 16 – 160.7", SN 17 – 161.1", SN 18 – 161.02",
SN 20 – 161.3"

Inspected / Certified By:



Christine Plummer, Quality Dept. January 15, 2016

Material Certification

MILL ORDER: 0066998
PART NUMBER: 72313.BO
P.O. NUMBER: 354505

Certificate of Conformance - Part 1 of 2
P.O. DATE: 9/8/2015

Part 1 - PAGE NUMBER: 1 of 1
PRINTED: 11/23/15 08:38

SERIAL NUMBER: DNK-0066998-G22575-81202

S A. M. CASTLE & CO.
O T 1420 KENSINGTON ROAD
L O SUITE 220
D OAK BROOK, IL 60523

S A.M. CASTLE & CO.
H T 299 CANAL ROAD
I O
P FAIRLESS HILLS, PA 19030

Material Description: STAINLESS STEEL ROUND BAR 17-4 EAF+AOD SOLUTION TREATED & AGED COND H1025 ROUGH TURNED ASTM A564-13 (type 630 condition H1025),

Size: 3.5000 DIAM X 160.0000 CUT-TO-LENGTH

Heat Number	TOP	W%	C	MN	SI	S	P
G22575			0.032	0.79	0.38	<0.001	0.022
			CR 15.54	W <0.05	V 0.07	NI 4.34	MO 0.27
			CO 0.05	CU 3.30	SN 0.009	PB	CB 0.24
			TA <0.01	AL 0.08	TI <0.01	FE	B 0.001
			O	MG	CA 0.001	SE	ZR
			AG	BI	N 0.033	H	CQ

HARDNESS: 348 HBW

HARDNESS: 34.9 HRC

TENSILE: DIR. T/S KSI 0.2% Y/S KSI %EL %R/A
LONG. 168.0 163.9 15.36 61.42

MACRO ETCH TEST: ACCEPTABLE

MATERIAL ID: NJAGKF

THIS MATERIAL WAS SOLUTION TREATED AT A TEMPERATURE OF 1900 °F/1 HR/AC + 1025 °F/4 HRS/AC

/S/Amy Giordano

/S/Miles Voigt

Date: 11/23/15

Prepared by: Amy Giordano

Miles Voigt, Lab Supervisor

Melted and manufactured in compliance with DFARS 252.225-7009 ALT 1. Melted and chemistry tested by USAP in Bridgeville, PA., USA. Material Manufactured in USA. Certification IAW DIN 50 049/EN 10204 3.1. Material complies with EU directive 2002/95/EC (RoHS). The test results shown are certified to be a correct statement of records that were derived from testing samples of the material. Results meet applicable specifications. No welding was performed on the material supplied on this order. Material is free from mercury contamination. Material is of NAFTA origin. This material was produced under the Dunkirk Specialty Steel Quality Management System documented in QP Manual, Rev. 10 dated 3/11/2015, conforming to NCA-3800. Material testing was performed as applicable in accordance with ASTM A370, A604, E8, E10, E18, E23, E45, E112, E139, E381, E572, E1019, STP-CHEM-GDS, E1444, & AMS 2315. The recording of false, fictitious, or fraudulent statements on this document may be punished as a felony under federal statutes, including Federal Law, Title 18, Chapter 47. Test results are maintained in company records. This certification shall not be produced, except in full, without written approval of Dunkirk Specialty Steel. Material is free from Radioactive Contamination. Safety Data Sheets (SDS) are available at www.univstainless.com. If applicable: Decarb test - furnace atmosphere is Argon; Corrosion Test (ASTM A262 Practice A) - Etchant used -10% Oxalic Acid; Microstructure @ magnification 250 - 500X. Stress Rupture, Bending Test (ASTM 384), and Microcleanliness tests performed by Westmoreland Testing Laboratory or Element Materials Technology. Impact Testing and Corrosion Test (ASTM A262 Practice E) performed by the NSL Testing Laboratory, Westmoreland Testing Lab or Element Materials Technology. Unless otherwise stated, Percentage Elongation is measured in 4D. Speed of Testing: 0.005 in/in/min.; 0.05 in/in/min.

Material Certification

MILL ORDER: 0066998
PART NUMBER: 72313.B0
P.O. NUMBER: 354505
SERIAL NUMBER: DNK-0066998-G22575-81386

Certificate of Conformance - Part 1 of 2
P.O. DATE: 9/8/2015

Part 1 - PAGE NUMBER: 1 of 1
PRINTED: 12/3/15 08:46

RECERTIFICATION - ADDED MATERIAL ID NUMBER

S A. M. CASTLE & CO.
O T 1420 KENSINGTON ROAD
L O SUITE 220
D OAK BROOK, IL 60523

S A.M. CASTLE & CO.
H T 299 CANAL ROAD
I O
P FAIRLESS HILLS, PA 19030

Material Description: STAINLESS STEEL ROUND BAR 17-4 EAF+AOD SOLUTION TREATED & AGED COND H1025 ROUGH TURNED ASTM A564-13 (type 630 condition H1025),

Size: 3.5000 DIAM X 160.0000 CUT-TO-LENGTH

Heat Number	TOP	Wt	C	0.032	MN	0.79	SI	0.38	S	<0.001	P	0.022
G22575			CR	15.54	W	<0.05	V	0.07	NI	4.34	MO	0.27
			CO	0.05	CU	3.30	SN	0.009	PB		CB	0.24
			TA	<0.01	AL	0.08	TI	<0.01	FE		B	0.001
			O		MG		CA	0.001	SE		ZR	
			AG		BI		N	0.033	H		CQ	

HARDNESS: 348 HBW

HARDNESS1 35.8 HRC

TENSILE: DIR. T/S KSI 0.2% Y/S KSI %EL %R/A
LONG. 172.6 168.3 13.46 58.25

MACRO ETCH TEST: ACCEPTABLE

MATERIAL ID: NJAGHX

THIS MATERIAL WAS SOLUTION TREATED AT A TEMPERATURE OF 1900 °F/1 HR/AC + 1025 °F/4 HRS/AC

/S/Amy Giordano

/S/Kevin Seidel

Date: 12/03/15

Prepared by: Amy Giordano

Kevin Seidel, Technical Mgr.

Melted and manufactured in compliance with DFARS 252.225-7009 ALT 1. Melted and chemistry tested by USAP in Bridgeville, PA., USA. Material Manufactured in USA. Certification IAW DIN 50 049/EN 10204 3.1. Material complies with EU directive 2002/95/EC (RoHS). The test results shown are certified to be a correct statement of records that were derived from testing samples of the material. Results meet applicable specifications. No welding was performed on the material supplied on this order. Material is free from mercury contamination. Material is of NAFTA origin. This material was produced under the Dunkirk Specialty Steel Quality Management System documented in QP Manual, Rev. 10 dated 3/11/2015, conforming to NCA-3800. Material testing was performed as applicable in accordance with ASTM A370, A604, E8, E10, E18, E23, E45, E112, E139, E381, E572, E1019, STP-CHEM-GDS, E1444, & AMS 2315. The recording of false, fictitious, or fraudulent statements on this document may be punished as a felony under federal statutes, including Federal Law, Title 18, Chapter 47. Test results are maintained in company records. This certification shall not be produced, except in full, without written approval of Dunkirk Specialty Steel. Material is free from Radioactive Contamination. Safety Data Sheets (SDS) are available at www.univstainless.com. If applicable: Decarb test - furnace atmosphere is Argon; Corrosion Test (ASTM A262 Practice A) - Etchant used -10% Oxalic Acid; Microstructure @ magnification 250 - 500X. Stress Rupture, Bending Test (ASTM 384), and Microcleanliness tests performed by Westmoreland Testing Laboratory or Element Materials Technology. Impact Testing and Corrosion Test (ASTM A262 Practice E) performed by the NSL Testing Laboratory, Westmoreland Testing Lab or Element Materials Technology. Unless otherwise stated, Percentage Elongation is measured in 4D. Speed of Testing: 0.005 in/in/min.; 0.05 in/in/min.

MILL ORDER: 0066998

PART NUMBER: 72313.BO

P.O. NUMBER: 354505

SERIAL NUMBER: DNK-0066998-G22260-81249

Certificate of Conformance - Part 1 of 2

P.O. DATE: 9/8/2015

Part 1 - PAGE NUMBER: 1 of 1

PRINTED: 11/24/15 09:39

S A. M. CASTLE & CO.
O T 1420 KENSINGTON ROAD
L O SUITE 220
D OAK BROOK, IL 60523

S A. M. CASTLE & CO.
H T 299 CANAL ROAD
I O
P FAIRLESS HILLS, PA 19030

Material Description: STAINLESS STEEL ROUND BAR 17-4 EAF+AOD SOLUTION TREATED & AGED COND H1025 ROUGH TURNED ASTM A564-13 (type 630 condition H1025),

Size: 3.5000 DIAM X 160.0000 CUT-TO-LENGTH

Heat Number	Wt	C	MN	SI	S	P
G22260	TOP	0.029	0.72	0.25	0.002	0.023
		CR 15.38	W <0.05	V 0.07	NI 4.24	MO 0.23
		CO 0.05	CU 3.24	SN 0.013	PB	CB 0.23
		TA <0.01	AL <0.01	TI <0.01	FE	B 0.001
		O	MG	CA	SE	ZR
		AG	BI	N 0.040	H	CQ

HARDNESS: 344 HBW

HARDNESS: 37 HRC

TENSILE: DIR. T/S KSI 0.2% Y/S KSI %EL %R/A
LONG. 167.1 162.4 14.69 58.0

MACRO ETCH TEST: ACCEPTABLE

THIS MATERIAL WAS SOLUTION TREATED AT A TEMPERATURE OF 1900 °F/1 HR/AC + 1025 °F/4 HRS/AC

/S/ Amy Giordano

/S/ Miles Voigt

Date: 11/24/15

Prepared by: Amy Giordano

Miles Voigt, Lab Supervisor

Melted and manufactured in compliance with DFARS 252.225-7009 ALT 1. Melted and chemistry tested by USAP in Bridgeville, PA., USA. Material Manufactured in USA. Certification IAW DIN 50 049/EN 10204 3.1. Material complies with EU directive 2002/95/EC (RoHS). The test results shown are certified to be a correct statement of records that were derived from testing samples of the material. Results meet applicable specifications. No welding was performed on the material supplied on this order. Material is free from mercury contamination. Material is of NAFTA origin. This material was produced under the Dunkirk Specialty Steel Quality Management System documented in QP Manual, Rev. 10 dated 3/11/2015, conforming to NCA-3800. Material testing was performed as applicable in accordance with ASTM A370, A604, E8, E10, E18, E23, E45, E112, E139, E381, E572, E1019, STP-CHEM-GDS, E1444, & AMS 2315. The recording of false, fictitious, or fraudulent statements on this document may be punished as a felony under federal statutes, including Federal Law, Title 18, Chapter 47. Test results are maintained in company records. This certification shall not be produced, except in full, without written approval of Dunkirk Specialty Steel. Material is free from Radioactive Contamination. Safety Data Sheets (SDS) are available at www.univstainless.com. If applicable: Decarb test - furnace atmosphere is Argon; Corrosion Test (ASTM A262 Practice A) - Etchant used -10% Oxalic Acid; Microstructure @ magnification 250 - 500X. Stress Rupture, Bending Test (ASTM 384), and Microcleanliness tests performed by Westmoreland Testing Laboratory or Element Materials Technology. Impact Testing and Corrosion Test (ASTM A262 Practice E) performed by the NSL Testing Laboratory, Westmoreland Testing Lab or Element Materials Technology. Unless otherwise stated, Percentage Elongation is measured in 4D. Speed of Testing: 0.005 in/in/min.; 0.05 in/in/min.

EXTRUSION INSPECTION SHEET



TUBE #	TOTAL LENGTH	SIDE A		SIDE B		Measurement unit		Inches	Symbol	"	ULTRA SONIC MEASUREMENTS						
		DIA		DIA		INSIDE DIA	wall thickness measured w/vern				Strightness at 12" in middle	Rockwell Reading	LOCATION on tube	R1	R2	R3	R4
		R1	R2	R1	R2												
DWG											N/A	Middle	N/A				
1	161.125	3.325	3.324	3.324	3.325	2.380	.479	.475			N/A	Middle	.462	.465	.464	.468	
2											N/A	Middle					
3											N/A	Middle					
4											N/A	Middle					
5											N/A	Middle					
6	160.850	3.300	3.302	3.302	3.300	2.375	.466	.473			N/A	Middle	.465	.462	.457	.461	
7											N/A	Middle					
8											N/A	Middle					
9											N/A	Middle					
10											N/A	Middle					
11											N/A	Middle					
12											N/A	Middle					
13											N/A	Middle					
14											N/A	Middle					
15											N/A	Middle					
16											N/A	Middle					
PART #		6020-160				P/O#		28800		BATCH #		133623		Notes:			